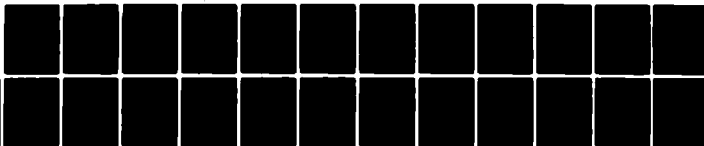


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This paper reviews a long term research project which describes and analyzes the U.S. and Japanese electronics industries. The research is based on an organization theory application of an efficiency model. The project's long range purpose is to describe and understand firm's strategic relations with other firms so that more efficient, equitable, & effective transactions can be determined and implemented. This paper reviews 6 components of this project with preliminary results that indicate structural differences between the U.S. and Japanese electronics industries.		

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PROGRAM FOR RESEARCH ON ORGANIZATIONS AND MANAGEMENT:
The United States - Japanese Electronic Industries Study*

by
William G. Ouchi
Jay B. Barney
Dave Ulrich

UCLA
Graduate School of Management

August 1981

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ABSTRACT

This paper reviews a long term research project which describes and analyzes the United States and Japanese electronics industries. The research is based on an organization theory application of an efficiency model. The project's long range purpose is to describe and understand firm's strategic relations with other firms so that more efficient, equitable, and effective transactions can be determined and implemented. This paper reviews six components of this project with preliminary results that indicate structural differences between the United States and Japanese electronics industries.

PROGRAM FOR RESEARCH ON ORGANIZATION AND MANAGEMENT:

The United States - Japanese Electronic Industries Study

I. INTRODUCTION

Recent publication of several books on Japanese industry [19], [13], [15], has sparked widespread interest throughout the United States in Japanese management and its relation to productivity. While these and other works are important in describing the style of many Japanese managers, they may not tell the whole story of apparent Japanese efficiency, effectiveness, and productivity. A recent review of some of this work in [1] noted the importance of understanding management practices and their relation to productivity, but suggested that Japanese success could not be fully understood without also considering relations between Japanese firms and between industry and government in Japan. This review noted that,

In focusing exclusively on the role of management in Japan's success, (we) may neglect to mention many other contributing factors. Among these are the relatively weak Japanese anti-trust laws; government sponsorship of favored industries; a high rate of savings in Japan, which makes capital cheap, and the large shareholdings in major corporations by Japanese banks, which are often willing to forego fat dividends until the firm has carved out an unchallengeable market share. [1, p. 11].

The primary purpose of this paper is to describe a research project that is being undertaken at the Graduate School of Management at UCLA. This project, entitled the Electronics Industry Study, has a long range purpose of understanding strategic relations between firms. This paper reviews this project in several sections. We begin by introducing a general theoretical

framework that guides this research. Next, as an example of the range of research questions considered in the project, we present a brief historical review of the United States and Japanese computer industries. Following this, several specific research studies that together form the bulk of the project are reviewed. The first three of these studies have progressed more quickly and will be discussed in more detail. As appropriate, empirical results will be reported.

II. THEORETICAL FRAMEWORK

An emerging organization theory framework that generates important insights into the analysis of cooperative relations between firms and between industries and government was originally developed in economics by [21]. Known by various names, including the transaction costs framework and the organizational failures framework, this perspective on organizations will be the conceptual base for our empirical comparisons of the United States and Japanese electronics industries. This framework, and its relevance to the research paper described below, is discussed in some detail elsewhere [13], [14], and [2]. We will introduce and briefly describe this conceptual framework with an example of the application of the model.

Consider a typical United States example of firm relations with other firms. Suppose a computer manufacturer became aware of a new and powerful semi-conductor chip uniquely manufactured by a particular LSI company and wished to design this new chip into its next generation computers. The computer firm in the United States may be reluctant to design its new machine around this new device, fearing that once this takes place, it will be at the mercy of its sole supplier of this chip. Once the computer firm makes the design investments, they often cannot be changed to incorporate new LSI devices without considerable expense. Under these conditions, the

chip manufacturer could raise prices, lower quality, or provide poor service, all without unduly jeopardizing the sale of its device to the computer manufacturer.

Three alternatives immediately present themselves to the computer manufacturer. First, they may decide not to incorporate the new chip into its design, and thus avoid any sole supplier relations. Unfortunately, this may also lead to an inferior product in the market. Second, the computer firm may acquire the chip manufacturer. Such vertical integration seems likely to insure stable low cost supplies of the device to the computer firm, but may have some secondary negative consequences. For example, the computer firm may not have LSI manufacturing competence, which could cause a rise in manufacturing costs. Also, whereas LSI research and development was the sole interest of the separate semi-conductor firm, LSI development in the vertically integrated firm may only be a small percent of total R & D expenditures. Under such conditions, the vertically integrated firm may be less innovative in LSI technology than the separate semi-conductor firm. Finally, the computer firm may require the semi-conductor manufacturer to license another firm to also manufacture the new device, in exchange for a guarantee that the computer firm buys most of the new devices it uses from the original semi-conductor firm. Such second sourcing, though common in the United States electronics industry, is fraught with difficulties. First, it is often difficult to find a semi-conductor firm willing to manufacture the new device under such restrictions. Second, because these devices are so complex, it may be difficult to transfer all the knowledge and understanding necessary to the second source for it to manufacture a high quality product. Moreover, the original semi-conductor firm may choose not to transfer all the relevant information, thus insuring that the second source manufactures an inferior product. Also, because of the

complexity of the manufacturing process and the amount of proprietary information, the computer firm may not be able to adequately police the development of a second source to assure high quality.

In Japan, computer manufacturers facing a similar situation could also adopt one of these three alternatives. Indeed, it appears that vertical integration is a common solution to this particular single sourcing problem. However, two additional alternatives may be available to the Japanese firm that may not be available to United States firms. First, Japanese computer manufacturers might be able to call on a third party (such as M.I.T.I. or a bank) to mediate the exchange and insure that both parties were dealt with equitably. This third party would have to have intimate knowledge of both parties to the exchange. It would also have to be trusted to decide ambiguous and complex issues in ways that would assure long-term equity in the exchange. [8] shows how this third party guarantor helps assure equitable relations within large Japanese firms. At the firm level, this third party could be the government, but is more likely to be a bank that has substantial holdings in both firms and enjoys a long-term, stable, and intimate relation with both firms. If either actor behaves in a way so as to jeopardize an equitable exchange, the bank may take appropriate action. Second, the potential problems associated with single source relations could be considerably lessened in the two firms in Japan if they had mutual and joint interests in maintaining a long term equitable exchange. This could occur, for example, if each firm held substantial amounts of stock in the other firm, thus increasing the likelihood of cooperation between firms.

In the above example, we have described five ways an exchange can be governed: through no exchange, through a common hierarchy (vertical integration), through a quasi-market mechanism (second sourcing), or through

one of two "intermediate" forms of governance. These governance mechanisms are depicted in Figure 1.

[Figure 1 goes here]

These last forms of governance are basically markets in nature, but are assisted by hierarchies or clans (i.e. cooperative) mechanisms. In the intermediate case, firms remain separate, but ambiguous or complex exchange issues are mediated by a third party with an interest in maintaining an equitable relationship, i.e., a bank, or firms recognize their joint interest in maintaining such a relationship due to interdependent ownership. This extended example summarizes the theoretical context underlying the research project.

III. HISTORIES OF THE UNITED STATES AND JAPANESE COMPUTER INDUSTRIES*

The United States computer and semiconductor industries have grown rapidly since their inception in the early 1940's. The industry originated with the first modern digital computers, Mach I and ENIAC. In the 1940's, leading electronics technology included vacuum tubes and was principally applied to information processing in the military. In the 1950's, transistors were the major technical innovation. Products such as silicon transistors were developed by Texas Instruments in 1954 and continued to predominantly serve the military and aerospace markets. Throughout the 1960's, technical innovations such as the Integrated Circuit (IC), Medium Scale Integration (MSI), and Large Scale Integration (LSI) became dominant technologies, often used in both military and non-military computer markets. In the 1970's and into the 1980's, Intel maintained a technical lead in a rapidly evolving market with Very Large

*Our study includes ten major product-market segments of the electronics industries, of which "computers" is one. This brief historical overview is meant to indicate the range of research questions that we are pursuing.

Scale Integration (VLSI). Such semi-conductor devices are currently used in a variety of applications from automobiles to office machinery [18], [4]. Current projects indicate that the electronics industry should remain one of this country's most valuable assets and critical industries through the 1980's [11].

Fairchild Publications reports annually on the United States electronics industry by summarizing the reports filed by public firms (10-K, corporate reports) in a book entitled The Electronic NewsFinancial Fact Book and Directory. In the 1980 edition, this text included summary information on 680 firms.

The Japanese computer industry began in the mid-1950's with the Ministry of International Trade and Industry (MITI) sponsoring electronics research. MITI founded the Research Committee on Computers, comprised of prospective manufacturers, industry leaders, and research scientists, to study Japan's investment in the electronics field. However, real growth in the Japanese electronics industry began in the mid-1960's. By this time, IBM had developed the System 360 computer. This machine highlighted both the future relevance of electronic technology and Japan's lack of technological development vis-a-vis the United States industry. As the importance of the electronics industry became clear, MITI began to allocate resources to firm's research and development and manufacturing. Firms such as the Japan Electronic Computer Corporation (a joint venture of seven computer manufacturers), and the Japan Software Company (a joint venture of Fujitsu, Hitachi, and Nippon Electric), all received government support for electronics development. As a result, these firms began to invest great amounts of time and resources to develop, manufacture, and market new electronics technologies. In the 1970's, the Japanese electronics industry continued to grow rapidly. In 1974, MITI published a document entitled [7]"Japan's Industrial Structure -- A Long Range Vision" which reviewed Japan's commitment to the electronics industry:

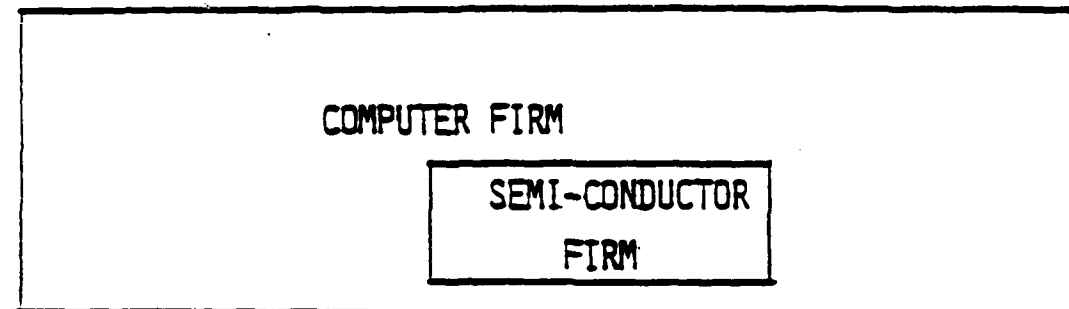
"The computer, which will form the core of informationalization, will probably record an especially large expansion in demand as information-

EXAMPLE OF EFFICIENCY HYPOTHESIS:
US CASE OF COMPUTER AND SEMI-CONDUCTOR FIRMS

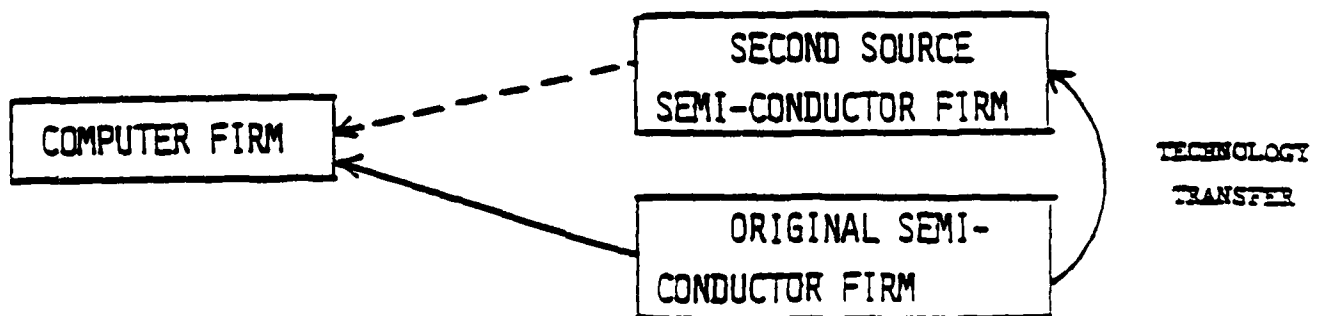
COMPUTER FIRM

SEMI-CONDUCTOR
FIRM

(A)
No EXCHANGE



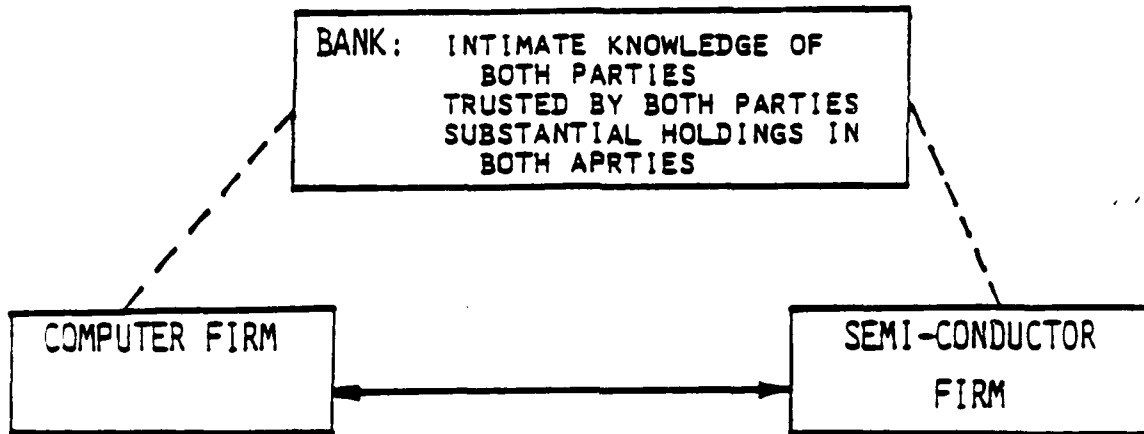
(B)
VERTICAL INTEGRATION



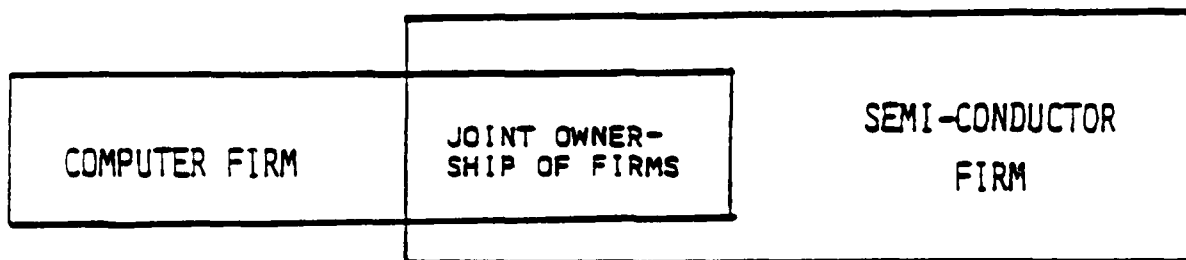
(C)
SECOND SOURCING

FIGURE 1 (CONT.)

EXAMPLE OF EFFICIENCY HYPOTHESIS:
INTERMEDIATE GOVERNANCE MECHANISMS



(A)



(B)

alization progresses in industry, in society, and in the people's lives. . . . The role played by imported technology centering on technology in the electronics industrial fields has been very important, but now that Japan has reached the same general technological level as Europe and America, the self-development of technology will be a big issue for the future." (pp. 71-72)

Japanese firms have been successful in their endeavors to develop technology and capture world market share in electronics. Their world market share has increased significantly in the last decade. Dr. Robert Noyce, Vice-Chairman, Intel Corporation, testified before the Subcommittee on International Finance of the Committee on Banking, Housing, and Urban Affairs of the United States Senate that one of the major challenges the United States electronics industry in the 1980's faces is the rapid technological and market growth of the Japanese industry [10].

The Oriental Economist publishes a book that summarizes many Japanese firms similar to that published by Fairchild Publications. This book, entitled Japan Company Handbook, includes summaries of public information on approximately 125 Japanese electronics firms.

Two relevant points should be highlighted from the above brief historical overview of the U. S. and Japanese electronics industries. First, both industries have become very complex. The products produced by the industries, and the number of firms in each have grown very rapidly with new applications of electronics technology. Second, despite their parallel growth, the United States and Japanese industries have evolved very differently. While the United States industry has grown through technological developments taking place in independently acting firms, the Japanese industry has grown with close cooperation between government and business and, in addition, cooperation across firms in the industry.

IV. ELECTRONIC INDUSTRY STUDY PROJECTS

The above analysis lays the foundation for a group of hypotheses that remain to be tested in our analysis of the United States and Japanese electronics industry. To test these hypotheses, several specific research studies have been designed. These are discussed below.

A. Taxonomy of United States and Japanese Electronics Industries

Recent work in organization theory [9] and competitive strategy [16] recognizes the importance of classification of firms into populations or strategic groups. Classification schemes group similar firms into populations. McKelvey argues that taxonomies will help develop the science of organizations, provide a basis for data retrieval about organizations, increase the generalizability and predictability of organization studies, and provide a basis for sampling in organization studies. Porter, in a more practical vein, proposes that managers who recognize their strategic group (population) can make improved strategic decisions. These strategic decisions include selecting suppliers, customers, and employees, recognizing competition, and identifying alternative operating decisions on product mix, speed of entry into a market, and evaluation of barriers to entry. In brief, the population concept helps firms assess their niche within an industry [17].

In the UCLA Electronics Industry Study, data are being collected on 680 United States and 125 Japanese firms. These data, when analyzed, will yield a taxonomy of firms into populations in both the United States and Japanese industries. The data for this taxonomy comes from firm's public reports (10-K, corporate reports) over three years (1978, 1979, 1980), as reported in the Fairchild and Oriental Economist publications. The information was coded from these reports by a team of researchers at UCLA. After coding this

information, each firm was contacted by telephone and key informants verified the information derived from secondary data. By coding secondary data and then contacting the firm for verification of the coded data, confidence is high that the information in the data set is accurate and reliable.

These data will yield a taxonomy which will provide a comprehensive and detailed description of the two industries. The taxonomy will be based on information outlined in Table 1 (see a copy of the survey in the appendix). These data have been placed in a firm-by-variable matrix so that a classification of firms has been derived using appropriate clustering algorithms (see Figure 2).

[Figure 2 goes here]

The cluster analysis groups firms with similar characteristics. Commonalities and subtle differences between firms will be identified via the clustering programs. For example, some United States firms (e.g. Silicon Systems Incorporated) sole relationships to the electronics industry is through the design and manufacture of components which are then sold to customers outside the firm (e.g. General Electric). Firms in this supplier category are likely to be clustered into one population, while firms operating in more markets and more complex technologies (e.g. Westinghouse) are likely to be clustered into another population.

The taxonomies of the United States and Japanese industries should show some interesting differences. Since the United States industry began with individual firms competing for resources, while Japanese firms collaborated through the government support in developing the industry, one hypothesis is that more diverse populations of firms exist in the United States than in Japan. The United States electronics industry will likely have more populations of firms which specialize with the electronics industry. This diversity will

FIGURE 2: OVERVIEW OF VARIABLE-BY-FIRM

CLUSTERING MATRIX

location size structure market/technology financial transfer agent ownership

UNITED STATES

Firm 1

Firm 2

.

.

.

Firm 680

JAPAN

Firm 1

Firm 2

.

.

.

Firm 125

likely reflect the "arms-length" competitive markets that often underlie American industry in general. In contrast, the Japanese electronics industry will likely be grouped into more distinct, large populations. The populations which are identified will be one of the foremost analytical efforts made to describe in depth a major United States and Japanese industry. It should begin to identify some of the structural differences between industrial development in the two cultures. The populations will also serve as a sample frame for future research which will describe in more detail transactions between firms in the industry.

B. Ownership Patterns.

In addition to collecting structural, market, and technology information, which will then be used in defining populations, data have also been collected on patterns of stock ownership in the United States and Japanese electronics industries. In the United States, all beneficiary owners (more than 5%) are required to file with the Securities Exchange Commission. For Japanese electronics firms, information on major shareholders is also public. Ownership information has been compiled for all 680 United States and 125 Japanese firms.

The ownership data should begin to reveal some significant differences between the United States and Japanese electronics industries consistent with our theoretical framework outlined above. First, since many of the United States firms were developed by technological entrepreneurs, our research should find much of the stock ownership maintained by those internal to the firm, either as a member of the firm's Board of Directors or as an officer of the firm. In contrast, since the Japanese firms have more and longer term relationships with other firms and financial sources, we would expect to find ownership patterns more widely dispersed.

Second, closer analysis of the ownership patterns will test the "Japan, Inc." hypothesis which has often been described. Firms which have major ownership in Japanese firms are likely to be those that either supply important resources or are supplied resources by the focal firm. For example, Aritsu Electric, while being an independent firm which produces telecommunications equipment, is owned by Nippon Electric (32%), its major customer, and by Sumitomo Bank and Insurance Companies (18%), its financial suppliers. The tight ownership relationships between supplier, producer, and customer may be indicative of long term, cooperative relationships which may exist within the Japanese industry [12], [14].

These hypothesized ownership patterns may begin to reveal some industry level phenomena that support and foster Japanese management systems which are receiving so much attention currently. For example, since firms share ownership with suppliers and customers, with banks often being the mediator or guarantor, managers may be more secure in the knowledge that their firm will very likely acquire the necessary resources to be productive over time. In addition, such ownership patterns are likely to indicate that many suppliers and customers have a vested interest to cooperate with each other. Firms with such incentives may share sensitive information about costs and prices, collaborate to maximize both firm's performance, and develop other characteristics of cooperative relationships such as goal congruence, symbolic representation of values, and control based on traditions.

C. Inter-Bank and Bank-Firm Relations

As mentioned above, many of the supplier, firm, customer relationships in the United States are kept "arms length" and separate, while in Japan, these relationships appear to often be linked through ownership patterns and other relationships. In addition to joint ownership, it appears that Japanese firms

may be linked through bank relationships. Historically, large Japanese banks have been at the center of the zaibatsu, or the more current keiretsu. The keiretsu emerged after World War II legislation against concentrated holding companies. The keiretsu do not have formal control over their members, but may affect member-firm behavior through mutual exchange of ownership shares, swapping members on the board of directors, and financial advice and assistance from the bank which is at the center of the keiretsu. Firms affiliated with a keiretsu may be able to receive preferred credit from the central financial institution. This preferred credit should allow the affiliated firms to assume more long term debt, as the financial institution which links the keiretsu need not receive immediate return on its investment in the firm. The UCLA Electronics Industry Study assesses United States and Japanese bank relationships between banks and between banks and electronics firms.

In one study, we examine ownership patterns of banks and insurance companies in Japan and New York City.¹ New York banks were selected as the American comparison to Japanese banks because New York represents a geographical area which parallels the Japanese bank systems. In addition, the New York banks

¹ Again, the data for this analysis is under development. The ownership of Japanese banks comes from the Japan Company Handbook. The ownership of United States banks is more complex and is being compiled from Federal Reserve information and from New York City and New York State information.

represent the center of commercial banking in the United States. All banks headquartered in New York City were included in the sample.²

The following data have been collected: First, a list of all Japanese banks was developed. Using information summarized in [6], ownership patterns between banks were recorded. It soon became obvious that marine and fire insurance companies, as well as life insurance companies, were important types of owners in this network. These organizations were also included in the analysis. A 114 by 114 matrix was formed, called OWN. Each cell (i,j) of OWN listed the percentage of stock bank/insurance company i owned of bank/insurance company j. For example, Nippon Credit Bank stock is owned by Dai-Ichi Kangyo Bank (2.9%), Nippon Life Insurance (2.3%), Sun tomo Marine Life Insurance (2.0%), Asahi Marine Life Insurance (1.8%), Dai-Ichi Marine Life Insurance (1.8%), and Mitsubishi Bank (1.7%). This network is depicted in Figure 3.

[Figure 3 goes here]

A second network of relations among banks was also collected. This network, called REF, listed the number of times two banks were co-listed as references by the same electronics firms. This network is also depicted in Figure 3.

The two networks, OWN and REF, were then subjected to a multiple network blockmodel analysis [20]. The clustering algorithm used was CONCOR [3]. A graph representation of the obtained blockmodel image matrices is represented in Figure 4.

[Figure 4 goes here]

² The alternatives to selecting and working with one geographical locale in the United States is to work with all banks in the United States, which is too large a data set, or to work with the 100 largest banks in the United States. This latter option was not taken because it would not be comparable with all banks in Japan since the Japanese sample includes both local, smaller banks and larger national banks. New York City banks are a comparable data set in terms of composition of the banks and the number of banks and the geographical dispersion of the banks.

FIGURE 3:

BANK/BANK RELATIONSHIPS

BANKS/INSURANCE CO.

BANKS/INSURANCE CO.

BANKS/INSURANCE COMPANIES OWN
WHAT PERCENTAGE (%) OF OTHER
BANKS/INSURANCE COMPANIES?

OWN

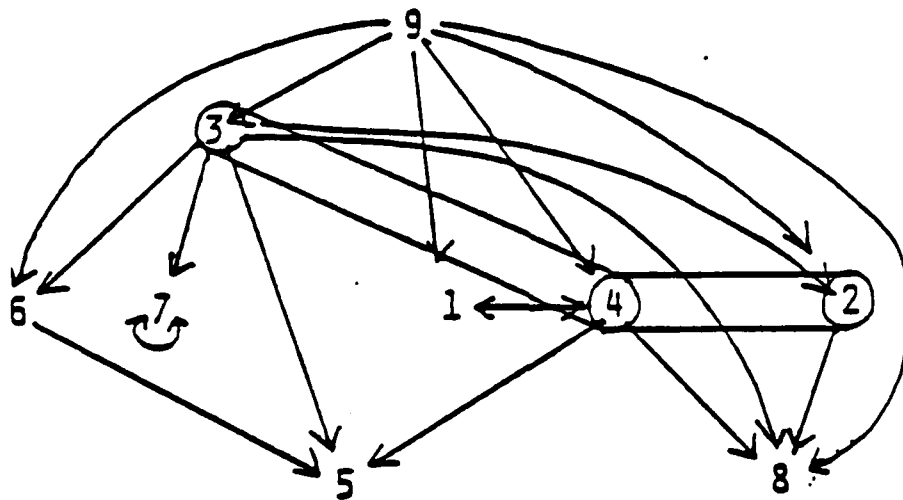
BANKS/INSURANCE CO.

BANKS/INSURANCE CO.

HOW MANY TIMES ARE BANKS/INSURANCE
COMPANIES CO-LISTED AS REFER-
ENCES BY JAPANESE ELECTRONICS FIRMS?

REF

FIGURE 4



STRUCTURE OF JAPANESE BANKS

A brief review of the graph in Figure 4 reveals a three tiered hierarchical structure. At the top of the figure (block 9), insurance companies have major holdings in all three tiers. One block of banks, (block 3), made up of large, national banks in Japan (e.g., Daiwa, Industrial Bank, Bank of Tokyo), also has substantial holdings in second and third tier banks. Second tier banks, including some national and regional banks, have substantial holdings in third tier banks. One of these blocks of third tier banks (block 8) is made up almost exclusively of Japanese savings banks. Third tier banks do not have substantial stock investments in any banks.

Turning to the co-listing of electronics firm references, it appears that blocks 2, 3, and 4 specialize in the electronics industry. Block 3 is likely to be a specialist in not only the electronics industry, but other industries because it is made up of large national banks. Blocks 3 and 4 represent banks which specialize in electronics firms.

While these findings are still tentative, the shape of the graph in Figure 4, when compared to a formal organization chart, is suggestive. It appears that Japanese banks may be subject to some degree of centralized control or coordination. This relationship, manifested through patterns of ownership, exists despite the fact that each bank included in the study is a separate, incorporated entity. Thus, apparently, banks in Japan are organized in a manner somewhere between market relations (each bank a separate entity) and bureaucratic/clan relations (centralized coordination or control). Previously, this organization was referred to as an intermediate governance mechanism.

Further research must address several questions. First, how does the structure depicted in Figure 4 differ from inter-bank relations in other countries. Early analysis of the structure of inter-bank relations in the

United States indicate that few intermediate-form relations exist. Rather, banks in the United States appear to be wholly owned subsidiaries of the same bank-holding company or financially not interdependent. Second, we must consider the dynamics that underlie the banking structure in Japan and the United States. A structure apparently exists in Japan that would facilitate interbank coordination, but it is still not clear if such coordination takes place. We also need to consider what impact these patterns of inter-bank relations might have for firms in the Japanese electronics industry. Similarly, if our tentative United States analysis holds, the effect of the United States inter-bank relations also needs to be considered.

The inter-locking banking system in Japan has several important potential implications for firm behavior. One of the fears that Dr. Noyce raised in testimony before the Senate Subcommittee was the significantly higher debt/equity ratio in Japanese electronics firms than in United States electronics firms:

The key concern of the (semiconductor) industry is its severe disadvantage in competing with aggressively-growing government subsidized foreign companies which have assured sources of capital and thus can price their products without concern for current earnings. The profitability of U. S. semiconductor firms is double or triple the profitability of the Japanese and European firms and the U. S. return on equity is double its foreign competition, despite almost exclusive U. S. reliance on equity capital. The U. S. companies raise most of their capital from retained earnings and equity investments while the average Japanese and European companies are able to borrow heavily, as evidenced by the higher debt to equity ratios. This is what U. S. semiconductor executives call the "leverage gap." In simplest terms, these data reflect the reasons why the U. S. semiconductor industry may grow less rapidly than our foreign competitors in the decade ahead.

	1978 Average After Tax Return on Equity	1978 After Tax Earnings As % of Sales	1978 Debt/equity Ratio
Six U. S. companies	16.3%	6.4%	16%
Four Japanese companies	8.0%	1.9%	345%
Two European companies	9.6%	2.4%	47%

The above statement represents a common concern in the United States electronics industry that the higher debt/equity ratio in Japanese industry favors long term investment. The bank data described above may help us to understand why the Japanese bank system can seem to assume such high risk. The regional bank which specializes in electronics may not need to assume the entire risk of a firm borrowing heavily. That bank, which has stock owned in significant percentages by banks in a higher tier (either large central bank or insurance companies), may be able to pass some of the risk on to its owner banks. This sponsorship may allow the regional banks which specialize in electronics to allocate larger loans to electronics firms. This may be even more the case since it may often occur that the financial institution which is loaning the money is at the center of a keiretsu and has ownership interests of its own in the electronics firm. This infusion of money supports the electronics firm in its commitment to growth without undue short term demands for immediate profits.

United States firms, in contrast, are generally faced with monthly or quarterly profit reports and demands from dispersed owners. Financial institutions, not backed by more powerful banks, are unable to finance firms with higher debt/equity ratios. As a result, the United States electronics firms may not have access to financial support as might Japanese firms. As Dr. Noyce indicates, this financial support may be a key factor in the future of the electronics industry:

Given the increasing capital intensity in our industry and the need to increase R & D . . . the U. S. semiconductor industry in the 1980's will

have to increase after tax earnings from an average of 4.3% during 1968 - 1977 to 13.5% (or obtain equivalent tax or other financial incentives) Foreign government subsidies to semiconductor research and capacity were estimated at \$2.0 billion The key concern of the industry is its severe disadvantage in competing with aggressively growing, government-subsidized foreign companies which have assured sources of capital and thus can price their products without concern for current earnings In the last analysis access to capital may be the decisive factor in determining the world market share leader by the end of this decade.

D. A Trade Association Study

From preliminary discussion with trade association personnel in the United States and Japan and with industry leaders in the electronics field, the role of trade associations in the two cultures appears to differ. In the United States, when government agencies attempt to enact new legislation, the more powerful firms send representatives to interact with those agencies to lobby for industry interests. Dr. Noyce's testimony represents this type of action as he presented Intel's point of view to the Senate Subcommittee. It is possible that the intense, but uncoordinated efforts of numerous firms in the United States could cause more confusion than direction in the relevant government agencies.³

³ There is some evidence that firms in the United States are discouraged from such cooperative lobbying because of some potential anti-trust violations.

In Japan, individual firms seldom interact directly with government agencies. Instead, the firms work together with other firms through associations to interact with government agencies. This more coordinated industry lobbying effort may have its rewards as the government agency is able to reasonably discuss industry needs and identify legislation which benefits both industry and government.

This project will deal with the role of trade associations in the two cultures. Initially, it will describe the various activities that trade associations perform, as well as the size and relationships among the trade associations themselves. As the study progresses, we hope to define some of the specific alternative trade association activities which can be followed to enhance the industry-government relations in both the United States and Japan.

E. Efficiency of Electronics Firms and Suppliers

Economists have recently made attempts to define the boundaries of a firm from an efficiency perspective. This perspective argues that a firm can better place its boundaries if it understands the nature of the transactions which it must undertake and applies appropriate governance mechanisms to those transactions [21], [22]. As briefly discussed above, organization theorists [12], [14] have begun to apply the efficiency model to an analysis of organization/supplier relationships.

In the efficiency model, three pure forms of governing supplier relationships exist: market, bureaucracy, and clan. The market governs relationships by price with firms keeping an "arms-length" from each other. Markets are not efficient under many circumstances (see [2] for a summary of these and related arguments). Markets are often replaced by bureaucracies, or organizations, which are governed by rules. In these cases, the supplier firm is likely to become a part of the manufacturing firm and the supplier would comply to the

rules set by the parent firm. Again, under certain transaction conditions, bureaucracies are not efficient, and they are replaced by clans. Clans govern behavior by a common set of shared values and traditions.

The efficiency model is a powerful alternative when explaining firm strategies for interacting with other firms. The model begins to identify the circumstances under which markets, bureaucracies, or clans are efficient means of governing transactions. This model is particularly useful in studies of United States and Japanese industries because the Japanese industry is more likely to follow a clan or hierarchical approach to governance between firms. Such hierarchical intermediate forms were discussed above. In the efficiency study with suppliers, we hope to identify when the market, bureaucracy, clan, or intermediate governance mechanisms are appropriate. This information can be central to issues of regulation and potential economies of scale and/or anti-trust implications of size.

The relevance of the efficiency of alternative governance mechanisms in the study of supplier relations in the electronics industry can be highlighted by the following incident:

When representatives of the American Automobile Manufacturers visited Japan in Spring of 1981, they noticed the robots, work groups, quality circles, and other commonly discussed characteristics of the Japanese work force. But they were most struck by one instance when a supplier drove his van up to the loading dock of the manufacturing firm. Unaided, he parked the truck, unloaded the supplies, and then looked around to find a broom and cleaned the area he was working in so that it was cleaner than when he arrived. The visitors were impressed. They speculated that if a supplier's delivery person in the United States had done the same thing, the plant's union would have likely reacted very negatively to an outside person working in the plant.

The efficiency descriptions of Japanese industry structure explain the supplier behavior as reasonable. Likely, the supplier firm had worked for many years with manufacturing firm. The two firms likely shared some degree of stock ownership. They also likely had dealings with the same bank. With these close associations, even the truck driver of the supplier firm might realize that his interests are well served by the manufacturing firm being profitable. It is only reasonable that he unload his supplies and clean the dock area.

F. Efficiency of Relationships Between Electronics Firms and Banks.

The same logic of applying an efficiency model to firm-supplier relationships fits with the firm-bank relationship. These firms which govern transactions with their bank efficiently are more likely to prosper. Efficient relationships between suppliers and banks and firms will provide a thorough description of the electronics industries in the two countries.

V. CONCLUSION

This paper has briefly described a long-term study of the United States and Japanese electronics industries. This study should provide some insights into the nature of the Japanese and United States industries and begin to explain how the industrial structure allows United States and Japanese management techniques to operate effectively. Two further points need to be made. First, while we are excited about the potential results of applying taxonomy analysis and efficiency models to the two industries, we realize that these are relatively new tools to the organization theorist. Because of their newness, we have been extremely careful to verify our study methods and conceptual frameworks with experts in the industry. Only through such joint academic/industrial interchanges can practical, yet conceptually sound models of industry structure and firm relationships develop. Second, one common criticism and interpretation of current research of the United States and Japanese industrial systems is the tendency among some to suggest that American firms

adopt Japanese management styles. We are in no way proposing this universal adoption of another culture's industrial structure or management practices. Nor are we suggesting that one management style is universally better than another. Rather, we hope our research provides insights to both United States and Japanese managers in the operation of their firms. It is our belief that both countries can benefit from the appropriate adoption of efficient and effective management systems.

May 1981

ELECTRONICS INDUSTRY STUDY
Secondary Data Code Sheet

_____(1-4) Company name:

_____(5-6) Address:

Phone Number

PRODUCT CATEGORIES (check = 1; blank = 0)

	Produces/ Manuf's Fabricates	Sells/ Markets	Distributes Services Installs	R & D Design Testing	Leases Rents	Other
1. Electronic Components	(7)	(8)	(9)	(10)	(11)	(12)
2. Power Generation/ Transmission	(13)	(14)	(15)	(16)	(17)	(18)
3. Industrial/ Manufacturing Electronics	(19)	(20)	(21)	(22)	(23)	(24)
4. Instruments	(25)	(26)	(27)	(28)	(29)	(30)
5. Communications Equipment and Systems	(31)	(32)	(33)	(34)	(35)	(36)
6. Consumer/Business Electronics	(37)	(38)	(39)	(40)	(41)	(42)
7. Computer and Computer Devices	(43)	(44)	(45)	(46)	(47)	(48)
8. Government/Military Electronics	(49)	(50)	(51)	(52)	(53)	(54)
9. Transportation	(55)	(56)	(57)	(58)	(59)	(60)
10. Other, Non-Electrical	(61)	(62)	(63)	(64)	(65)	(66)

_____(67-68) Total number of operating divisions

_____(69-70) Number of divisions in unrelated industries (non-electronics)

_____(71-72) Number of plants and facilities

_____(73-74) Number of acquisitions listed

Put a "1" in column 80 and Skip to column 7 of card 2

Transfer Agents: (Card 2) ____ (7-9) ____ (10-12) ____ (13-15) ____ (16-18)
____ (19-21) ____ (22-24) ____ (25-27) ____ (28-30)

	<u>1978</u>	<u>1979</u>	<u>1980</u>
Number of employees	____ (31-36)	____ (37-42)	____ (43-48)
Revenues (sales) (000's)	____ (49-55)	____ (56-62)	____ (63-69)
Net Income (profit) (000's)	____ (70-76)	CARD 3: ____ (7-13)	____ (14-20)
Number of Common Shares (000's)	____ (21-27)	____ (28-34)	____ (35-41)
Current Assets (000's)	____ (42-48)	____ (49-55)	____ (56-62)
Total Assets (000's)	____ (63-69)	____ (70-76)	CARD 4: ____ (7-13)
Current Liabilities (000's)	____ (14-20)	____ (21-27)	____ (28-34)
Long Term Debt (000's)	____ (35-41)	____ (42-48)	____ (49-55)
All Debts (000's)	____ (56-62)	____ (63-69)	____ (70-76)
Shareholder's Equity (000's)	CARD 5: ____ (7-13)	____ (14-20)	____ (21-27)
Specialization Ratio	____ (28-29)	____ (30-31)	____ (32-33)
Electronics Specialization (yes=2/no=1)	____ (34)	____ (35)	____ (36)
Electronics Related Ratio	____ (37-38)	____ (39-40)	____ (41-42)

Ownership Information

1. ____ (43-46)
2. ____ (47-50)
3. ____ (51-54)
4. ____ (55-58)
5. ____ (59-62)
6. ____ (63-66)
7. ____ (67-70)
8. ____ (71-74)
9. ____ (75-78)

Categories of Ownership

- 1 = industry
- 2 = bank/trust/finance company
- 3 = insurance company
- 4 = internal employees
(stock plan)
- 5 = internal employees
(officer)
- 6 = internal employees
(Board of Director)
- 7 = internal employees (officer/BoD)
- 8 = private investor
- 9 = management firm

TABLE 1:
 INFORMATION GATHERED ON
 680 UNITED STATES AND 125 JAPANESE ELECTRONICS FIRMS

location	US state Japanese province
size of firm	number of employees (in 1978, 1979, 1980) sales volume (three years) number of plants
structure of firm	specialization ratio (used by Wrigley, 1970 and Rumelt, 1974) number of divisions number of divisions in electronics
market/technology matrix	yes/no questions to 10 alternative electronics markets (e.g. components, power generation/t. ansmision, instruments, etc.) yes/not questions to give alternative technological activities within each market (e.g. manufacturers, markets, etc.)
financial data (three years)	revneues (sales) net income (profits) number of common shares current assets total assets current liabilities long term debt all debt shareholder's equity
transfer agent/bank references	banks that firms transact with
ownership data	beneficiary owners (own more than 5% of stock) and owner states (e.g. internal officer, member of Board of Directors, bank, industry, etc.)

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